WYLEYIA: A NEW BIRD HUMERUS FROM THE LOWER CRETACEOUS OF ENGLAND

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ABSTRACT. An imperfect humerus found in the Weald Clay (Lower Cretaceous) of Henfield, Sussex, represents the earliest British bird known, *Wyleyia valdensis* gen. et sp. nov. It is compared with other reptile and bird humeri from the Jurassic and Cretaceous.

IN July 1964 Mr. J. F. Wyley found an imperfect humerus in the Weald Clay (Lower Cretaceous) at Henfield, Sussex. It is reminiscent of certain advanced archosaur humeri; but, having compared it with the humeri of pterosaurs (from which it is completely distinct) and of small dinosaurs such as *Hypsilophodon* Huxley 1869 and *Deinonychus* Ostrom 1969, we are confident that it represents a bird. The particular bird-like characters which it shows are as follows:

1. There is a transverse ligamental furrow on the palmar surface just below the articulating area of the proximal end.
2. The deltoid crest is blade-like, large, and very thin.
3. There is some indication of a capital groove on the anconal surface.
4. The shaft is slender, hollow, and thin-walled.
5. There is a distinct groove (brachial depression) for the insertion of the brachialis anticus muscle.

The only other Lower Cretaceous bird remains known are *Gallornis straeleni* Lambrecht 1931 from France (assigned by Brodkorb in 1963 to the Phoenicopteridae), the gaviiform *Enaliornis* Seeley 1876 from the Cambridge Greensand of England, and indeterminate feathers from Australia.

SYSTEMATIC DESCRIPTION

Wyleyia valdensis gen. et sp. nov.

Plate 89; text-figs. 1–2

Holotype. Unique specimen in British Museum (Nat. Hist.) No. A 3658: an imperfect right humerus.

Diagnosis. Humerus similar in character to both *Archaeopteryx* von Mayer and *Ichthyornis* Marsh, but smaller. Proximal end of humerus relatively smooth and flattened. Deltoid crest extending for nearly one-third of length of humerus apparently making only slight angle with plane of the proximal palmar surface; palmar surface of crest itself with small longitudinal ridge on distal half and a very small curved depression at distal end; lower profile of crest forming angle of about 45° with external profile of shaft. No evidence of prominent bicipital surface. Bicipital crest large, relatively thick, and rounded along internal edge. Ligamental furrow present just below head on palmar surface. Shaft curved with some torsion (may be due to

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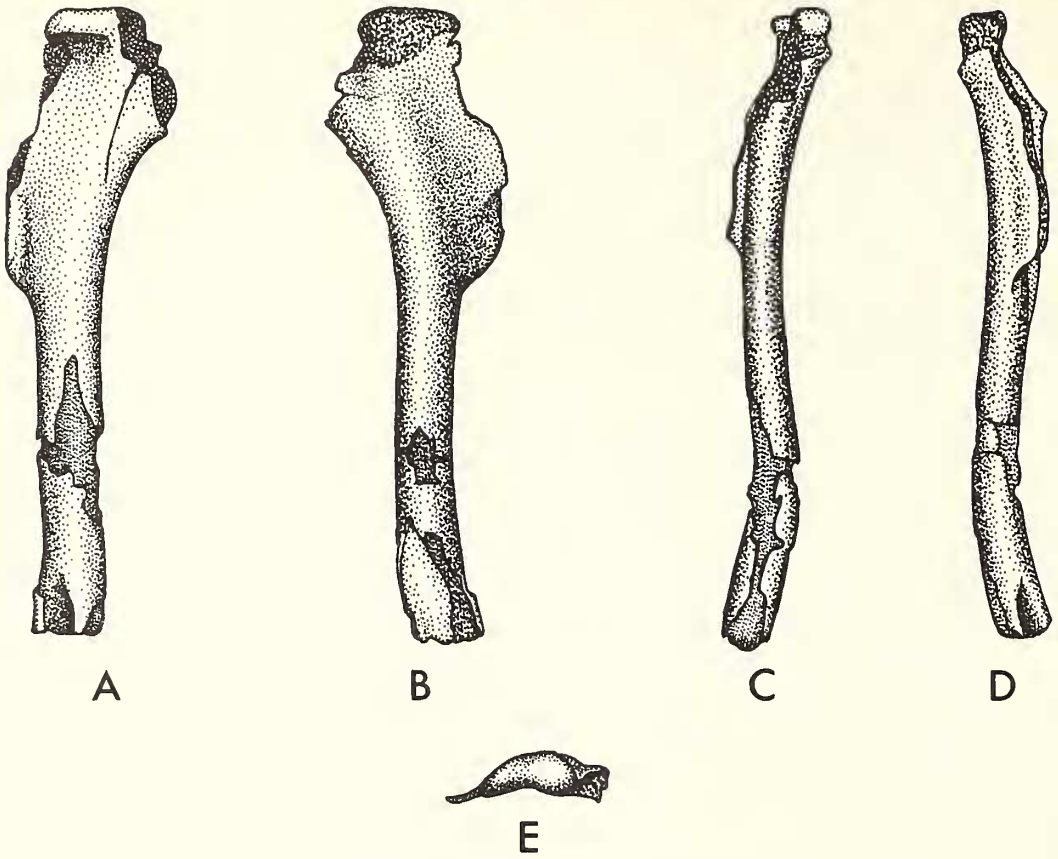

TEXT-FIG. 1. *Wyleyia valdenis* gen. et sp. nov. Holotype: right humerus (BMNH A 3658). ×2. A, palmar aspect; B, anconal aspect; C, internal aspect; D, external aspect; E, proximal aspect.

crushing), widening distally. Impression for brachialis anticus muscle nearer external side of shaft, fairly deep, broad (half as wide as shaft), and elongated.

Description. The specimen is a damaged right humerus, with the distal end missing altogether. The proximal end also is eroded and the outer part of the deltoid crest and the proximal part of the bicipital crest have been broken away. The head itself is damaged, but appears to have been prominent and rounded; there is some indication of a capital groove. Just below the head, on the palmar surface, there is a broad, shallow, transverse depression which is probably the remains of the ligamental furrow. The palmar surface is relatively smooth and slightly concave; the anaconal surface is rounded, especially towards the internal side, but tapers down on the

EXPLANATION OF PLATE 89

Wyleyia valdensis gen. et sp. nov. Holotype: right humerus (BMNH A 3658). Stereopairs, ×2. A, palmar aspect; B, anconal espect; C, internal aspect; D, external aspect; E, proximal aspect.

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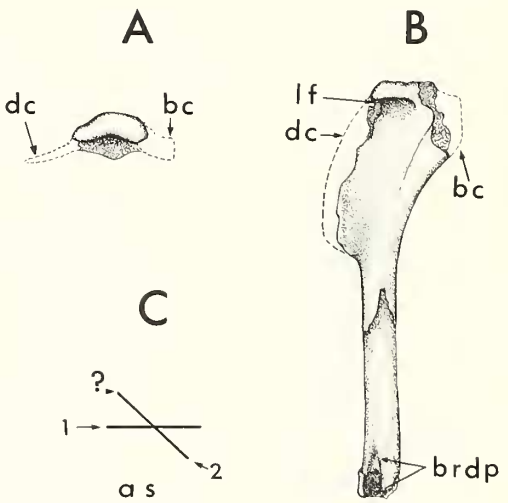
external side into the thin flange of the deltoid crest. The deltoid crest is long, about a third of the probable total length of the bone, and distally curves in rather abruptly to the shaft; its outer edge is broken, but on the palmar surface a small longitudinal ridge is apparent distally, running near and parallel to the edge. There is also a very small curved depression at the distal end of the crest, just next to the shaft. On the internal side the bone curves out evenly to form a bicipital crest, but lacks any prominent bicipital surface. The bicipital crest is thick and is curved on the anconal surface with no suggestion of a narrow flange indicated in the illustrations of the humeri of *Ichthyornis*. There is a small ridge where a median crest would be expected to occur, but no suggestion of a pneumatic fossa or foramen.

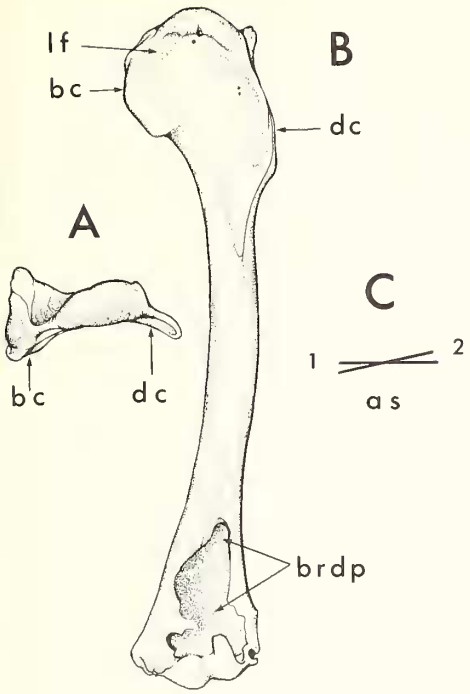
The centre of the shaft is slightly crushed, but allowing for this, its anconal profile is still slightly convex in lateral view; the shaft begins to widen towards the distal break. Also visible in this area, near the external side of the shaft, is the scar of the brachialis anticus muscle. It is fairly deep, broad (half as wide as the shaft), and elongated; its edges are relatively steep and the impression tapers proximally, appearing to terminate in a smaller and slightly deeper pit. There is some torsion in the shaft, so that the two ends of the bone were inclined to each other at a considerable angle (text-fig. 2C); some of it might be due to crushing, but it was in any case much greater than in a modern bird (text-fig. 3C).



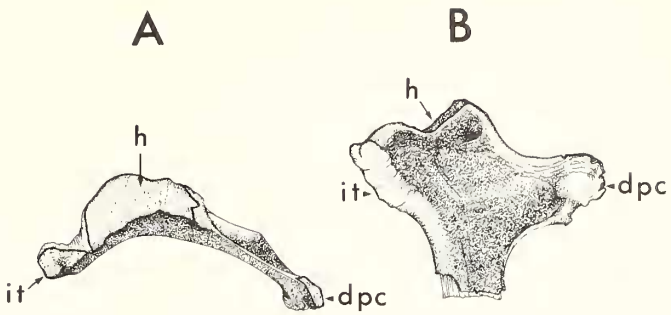
TEXT-FIG. 2. *Wyleyia valdensis* gen. et sp. nov. Holotype: right humerus. A, reconstruction of proximal aspect; B, reconstruction of palmar aspect, $\times 1\frac{1}{4}$; C, diagram showing approximate angle between proximal (1) and distal (2) articulations. Abbreviations used in this and other text-figures: as, anconal; bc, bicipital crest; brdp, brachial depression; dc, deltoid crest; dpc, deltopectoral crest; h, humeral head; it, internal tuberosity; lf, ligamental furrow.

Measurements (in millimetres):

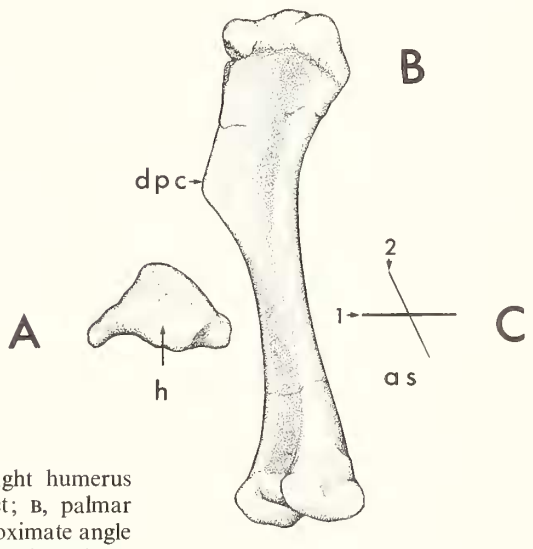
Total length as preserved	42·4
Length of deltoid crest	17·4
Length of bicipital crest	10·3
Width of shaft just distal to deltoid crest (internal–external)	4·5
Width of shaft just distal to deltoid crest (palmar–anconal)	3·3
Greatest width preserved at distal end	5·3



TEXT-FIG. 3. *Cathartes aura* (Turkey Vulture). Left humerus. A, proximal aspect; B, palmar aspect, ×approx. ½; C, diagram showing approximate angle between proximal (1) and distal (2) articulations. Abbreviations: see legend to text-fig. 2.



TEXT-FIG. 4. ?*Ornithocheirus clifti*. Proximal part of left humerus (BMNH 2353). A, proximal aspect; B, palmar aspect, ×⅔. Abbreviations: see legend to text-fig. 2.



TEXT-FIG. 5. *Hypsilophodon foxii*. Right humerus (BMNH R 196). A, proximal aspect; B, palmar aspect, ×⅔; C, diagram showing approximate angle between proximal (1) and distal (2) articulations. Abbreviations: see legend to text-fig. 2.

Occurrence. Weald Clay, Lower Cretaceous, Henfield, Sussex. The ostracods in the Henfield deposits indicate that they lie about 500–600 feet below the top of the Weald Clay. This would establish the horizon as being in the middle of the Reeves Group II, in the Barremian Substage of the Neocomian Stage.

COMPARISONS

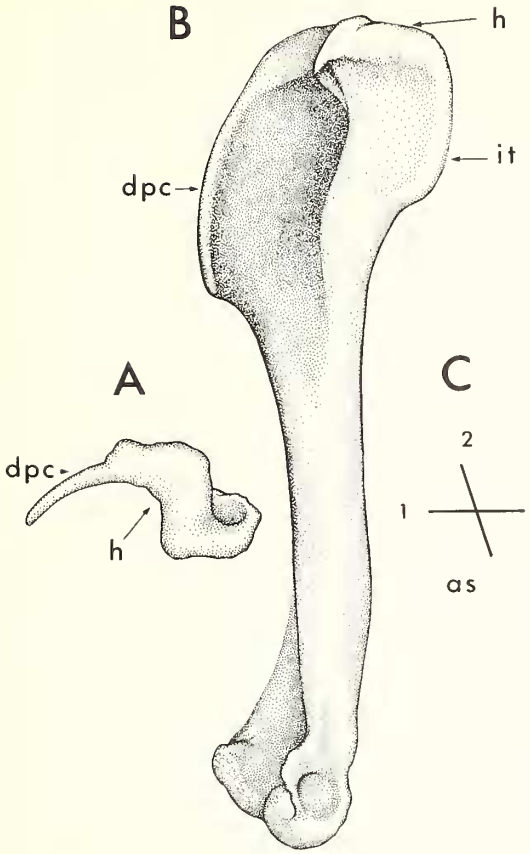
Because of the early Cretaceous age of *Wyleyia* it was felt necessary to compare it with humeri of certain archosaurs and early birds.

?*Ornithocheirus clifti* (Mantell). The humerus compared (BMNH 2353 and 2353a; text-fig. 4) is from the Wealden of Sussex. It resembles a bird humerus in having a thin wall and a hollow interior, but differs considerably in its general anatomy. The shaft is shorter and more massive with a large distal articulation. The articular head is fundamentally different in being saddle-shaped and concave in lateral view. The deltopectoral crest (deltoid crest in birds) also differs in being a thick projection rather than a thin blade, projecting at a much more acute angle to the plane of the proximal end.

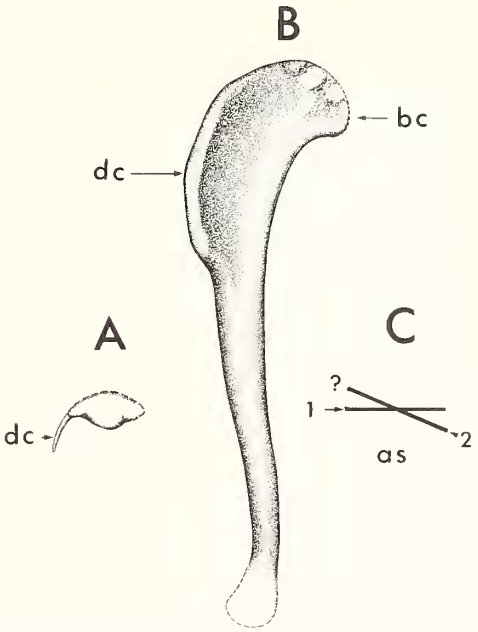
Hypsilophodon foxii Hulke. The humerus of this Wealden ornithopod from the Isle of Wight belonged to a small specimen (BMNH R 196; text-fig. 5). It differs from *Wyleyia* in several characters. Seen from above, the articulating area of the humeral head is more massive and triangular and not crescentic in shape. The bone lacks the transverse ligamental furrow on the palmar surface, the capital groove on the anconal surface, and the well-marked brachial depression at the distal end. The shaft is rather short and stout and has undergone a considerable amount of torsion, rather more than in *Wyleyia*, so that the two ends of the humerus are almost at right angles to each other. The deltopectoral crest is not blade-like but thick and blunt. Although there is some torsion present in *Wyleyia* which is certainly more than is found in modern birds, it is much less than is found in the majority of archosaurs. Some of the torsion present in the shaft of *Wyleyia* could be due to crushing.

Deinonychus antirrhopus Ostrom. Comparison was made with a cast of a humerus (AMNH 3015; text-fig. 6) of this Lower Cretaceous theropod from Montana. Like *Hypsilophodon*, it lacks the ligamental furrow of *Wyleyia* and the well-marked brachial depression; indeed, the brachialis anticus muscle has left no indication of its presence. Further, the deltopectoral crest lies in a different plane.

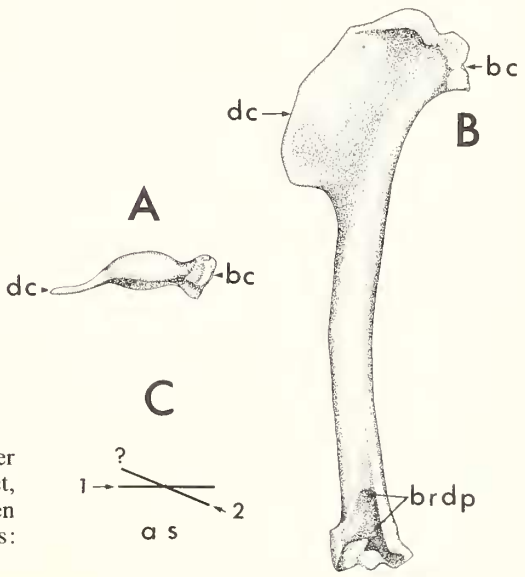
Archaeopteryx lithographica von Meyer. Comparison was made with the holotype (BMNH 37001; text-fig. 7) from the Upper Jurassic of Bavaria. Like *Wyleyia*, *Archaeopteryx* lacks most of the distinct prominences and ridges generally found in modern flying forms. The whole bone is slender and shows about the same amount of torsion in the shaft. The proximal end bears a simple head, slightly swollen and laterally elongated with a rounded articulation surface. The deltoid crest, however, diverges less abruptly from the shaft and is set almost at right angles to the palmar surface.



TEXT-FIG. 6. *Deinonychus antirrhopus*. Right humerus (AMNH 3015). A, proximal aspect; B, palmar aspect, $\times\frac{1}{2}$; C, diagram showing approximate angle between proximal (1) and distal (2) articulations. Abbreviations: see legend to text-fig. 2.



TEXT-FIG. 7. *Archaeopteryx lithographica*. Right humerus (BMNH 37001). A, proximal aspect; B, palmar aspect, $\times 1$; C, diagram showing approximate angle between proximal (1) and distal (2) articulations. Abbreviations: see legend to text-fig. 2.



TEXT-FIG. 8. *Ichthyornis dispar*. Right humerus (after Marsh, 1880). A, proximal aspect; B, palmar aspect, $\times 1\frac{1}{4}$; C, diagram showing approximate angle between proximal (1) and distal (2) articulations. Abbreviations: see legend to text-fig. 2.

Hesperornis Marsh and *Enaliornis* Seeley. These flightless birds had very reduced wings. The humerus of *Hesperornis*, from the Upper Cretaceous of Kansas, is long and slender with few prominent features; the humerus of *Enaliornis* (Lower Cretaceous of England) is unknown.

Ichthyornis Marsh. Plates in Marsh (1880; text-fig. 8) and a specimen in the BMNH A 905 were used for this comparison, although humeri of *I. victor* Marsh were distorted by crushing. The humeri of this Upper Cretaceous bird from Kansas resemble *Wyleyia* in the proportions of the various parts (including the length of the deltoid crest), the large deltoid crest projecting in approximately the same plane as the palmar surface, and the relatively flat nature of the proximal portion. They differ, however, in that (*a*) the bicipital crest does not project so far and is reduced in thickness, (*b*) the impression of the branchialis anticus muscle is shallow proximally and lies nearer the internal side of the shaft than the external.

CONCLUSIONS

Comparison with other Mesozoic material and Recent birds suggests that the new humerus is also that of a bird, showing the greatest resemblances to *Archaeopteryx* and *Ichthyornis*.

The fact that the humeri of *Archaeopteryx*, *Ichthyornis*, and *Wyleyia* are similar would not, however, seem sufficient reason to place *Wyleyia* in either the Archaeopterygiformes or Ichthyornithiformes, which would imply an affinity with the corresponding Jurassic or Cretaceous forms. It therefore seems advisable to consider the new genus *incertae sedis* until further evidence of affinity is forthcoming.

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Abbreviations. BMNH—British Museum (Natural History); AMNH—American Museum of Natural History.

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